REMARKS

Replacement Specification

Enclosed herewith is a replacement specification, claims, and abstract for the above-identified patent application. This replacement is a copy of the specification, claims, and abstract as filed in the USPTO and is not amended in any form.

The Examiner noted many apparent mistyped words in the document that was examined. At first, Applicants did not understand these comments by the Examiner, because the copy of the specification retained by Applicants did not have the problems identified by the Examiner. However, Applicants discovered that the image of the specification available on the PAIR system contained many examples of words with missing letters, especially in the first and last lines of pages in the imaged document. Applicants do not understand why the electronically imaged document omitted letters within words on an apparent random basis, but the enclosed document is a copy of the specification as filed and does not contain these errors.

Applicants note that the published version of Applicants' specification (2004/0152934, copy enclosed) does not contain the missing text that is seen in the imaged document in PAIR. This demonstrates that the original document received by the PTO did not contain missing text.

Because the original document was correct, irrespective of what is now contained in PAIR, Applicants submit there is no reason to submit an actual amendment to the specification. As noted above, Applicants are submitting a replacement copy of the specification, claims, and abstract.

Amendments to the Claims

Applicants have amended independent claims 1, 6, and 11 to include that a constituent of the reaction mixture is a pressure-maintaining amount of a non-reactive gas. Support for these amendments is found at page 4, lines 23-24, of the Specification.

Applicants' Invention

Applicants' claimed invention is a method of producing 5-tert-butyl-metaxylene comprising adding a suitable alkylating agent (e.g., isobutylene) at an effective rate to a reactor containing metaxylene and an active clay catalyst at

greater than normal pressure (i.e., >450 kPa) and at temperature at least 125 °C. The pressure is maintained using an inert gas such as nitrogen. The method also includes recovering a portion of the 5-tert-butyl-metaxylene and a portion of the metaxylene without removal of the active clay catalyst from the reactor, separating the 5-tert-butyl-metaxylene from the metaxylene, and recycling at least a portion of the metaxylene to the reactor.

Applicants found that this method extends the life of the active clay catalyst.

Claims

Objection

The Examiner objected to claim 12 as containing misspelled words. Again, this is an artifact of the image copy contained in PAIR. Claim 12 presented above as "original" reflects the text of the original application as filed.

Rejections under 35 USC 103

Claims 1-17 were rejected under 35 USC 103(a) over Fujita [Koichi] et al. (English-language abstract of JP3024021) in view of Zuech, U.S. Patent 3,849,507.

Fujita et al.

Applicants understand that the family name of the first-named inventor of the Japanese document is "Fujita" and not "Koichi." In any regard, this is the same document that was referenced in Applicants' specification.

The English abstract (obtained from esp@cenet) is brief and reads (with minor reformatting):

> PURPOSE: To safely improve the yield with facilitated separation by using a specific catalyst in reacting m-xylene with isobutylene and obtaining the subject compound useful as a synthetic musk raw material or synthetic intermediate for 2,6-dimethylaniline, etc.
>
> CONSTITUTION: m-Xylene is reacted with isobutylene in an amount of 0.1-1.0 mol, preferably 0.1-0.5 mol based on 1 mol m-xylene at 80-150 °C temperature under a low pressure of ordinary pressure to several kg/cm$^2$ (especially at about 130 °C under ordinary pressure) using activated clay as a reaction catalyst to afford the objective

compound. Although ordinary commercially available activated clay is used as the activated clay of the catalyst, a lower moisture content is preferred and especially ≤1wt.% moisture content is the optimum. The catalyst is used in an amount of 1-20 wt.%, especially about 10 wt.% based on the m-xylene. The reaction is carried out by a method for initially charging the m-xylene and catalyst and then continuously feeding isobutylene gas thereto.

The primary distinction between Applicants' invention and Fujita et al. is the reaction pressure and the method of maintaining that pressure. Fujita et al. teaches use of low pressure at "ordinary" pressure to several $kg/cm^2$ with ordinary (i.e., normal or atmospheric) pressure preferred. In contrast Applicants require a pressure greater than 450 kPa and require presence of an inert gas to maintain higher than an autogeneous pressure.

Applicants' minimum required pressure of 450 kPa converts (to two significant figures) to 50 psig and 4.5 $kg/cm^2$. In this conversion of units, Applicants use the convention that pressure measured in psig (pounds per square inch gauge) is the gauge pressure plus atmospheric pressure of 15 psi. Applicants submit that operation at a pressure of at least 450 kPa using an inert gas to maintain pressure is patentably distinct from Fujita et al.'s description of a pressure of atmospheric to several $kg/cm^2$.

Applicants' specification provides a direct comparison between operation at Applicants' required conditions and those preferred by Fujita et al. Comparative Example I at page 9-10 provides an experimental run using isobutylene added to metaxylene at 130 °C at normal pressure with a clay catalyst to form 5-tert-butyl-metaxylene with reuse of catalyst. This is compared to Example 1 at page 10 in which a comparable reaction is performed at 50 psig (450 kPa) with use of nitrogen gas to maintain the pressure. The data summarized in Table I and Table 1 show that in the Comparative Example, the metaxylene conversion has dropped from 49% to 8% after only three reuses of the catalyst. However, the data in Table 1 show that metaxylene conversion holds steady at 19-24% over 10 uses of the catalyst. This demonstrates that operation according to Applicants' method maintains catalyst activity and provides a commercial-practicable process.

Applicants submit that none of the teaching of Fujita et al. would lead a person of normal skill in the art to increase pressure with an inert gas in order to dramatically lengthen catalyst life.

Zuech

Zuech describes alkylation of aromatic hydrocarbons using a tubular reactor which contains a tableted clay catalyst through which flows olefin/aromatic reactant (col. 4, lines 13-17 and 39-42; col 2, lines 46-51). The Zuech process does not resemble either Applicants' process or that of Fujita in that Zuech teaches a fixed bed, tubular reactor through which a mixture of aromatic combined with an olefin is passed.

In the present invention, controlled amounts of olefin are added to a mixture of meta-xylene and clay catalyst. Persons skilled in the art recognize the distinctiveness of these methods of reaction and the products produced. In the former method, the concentration of olefin reactant to aromatic reactant is fixed by the preformed concentrations in the mixture. In the latter process, adding small amounts of a reactant slowly to a bulk amount of second reactant will result in a high concentration of bulk reactant with respect to the slowly added reactant at the site of catalytic activity.

Also, the Zuech method uses a tubular reactor through which a reactant mixture is passed over compacted catalyst tablets. This is quite distinct from conducting a reaction in a vessel containing catalyst material in continuous contact with the meta-xylene reactant.

Further, Zuech actively teaches away from using a powdered catalyst in continuous contact with a reactant. At col. 2, lines 46-51, Zuech states:

> "It is essential that the montmorillonite clays used in this invention be employed in a compacted state. In the instant process, it has been found that montmorillonite clays are unusually efficacious when they are employed in a compacted state rather than as finely divided powders." (emphasis added)

Applicants submit there is no basis to combine Zuech with Fujita, et al. in that there is no apparent motivation to combine the fixed bed process of Zuech with the reaction system described by Fujita, et al. Further, Zuech teaches away from use of a reactant mixture containing a clay catalyst through Zuech's

express teaching that it is "essential" to use a compacted catalyst as used in a fixed bed or tubular system.

Conclusion

Applicants submit that all claims now presented are in condition for allowance, and respectfully request reconsideration of the rejections made in the Office Action.

Respectfully submitted,

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